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Contribution by Turkey

to the CSTD 2020-2021 priority theme on "Using science, technology and innovation to close the gap on Sustainable Development Goal 3 on good health and well-being"

# PRIORITY THEME 2:

Using science, technology and innovation to close the gap on SDG 3, good health and well-being

**1. Can you give examples of projects/policies in your country aimed at using science, technology, and innovation for early warning, risk reduction and management of national risks? What are the main outcomes? And What are the main challenges confronted while trying to implement these projects/policies in your country or region?**

As an effective and worldwide accepted method for early warning, risk reduction and management for RDI policymaking, Turkey utilizes the method of “Technology Readiness Level (TRL) assessment” which enables the evaluation of technological readiness levels of funded RDI projects; and hence critical technologies; providing the policymakers with the ability to direct project applications to the right partners/support mechanisms, and thus ensuring effective and target-oriented use of resources.

Via the determination of the TRL levels, the "success and level of achieving technological progress" of the projects that have been provided R&D and innovation support by The Scientific and Technological Research Council of Turkey (TÜBİTAK) can be measured; and it has been possible to compare different technologies developed in R&D and innovation projects supported by TUBITAK in terms of their proximity to commerce/ market.

In order to determine the technological readiness levels of funded RDI projects; and hence critical technologies; questionnaire sets for each readiness level and calculation methodology have been developed by TUBITAK for 5 different areas, 3 of which were dedicated to the health sector: health-diagnostics, health-drugs and therapeutics, health-medical devices, general / engineering and software. The TRL questionnaires and methodology have recently been applied to more than 4000 RDI project coordinators as a pilot study within the scope of "Output Surveys for RDI Projects Funded by TUBITAK".

In this context, TÜBİTAK has conducted a comprehensive series of online surveys on RDI projects which have been supported financially through TÜBİTAK’s support mechanisms between the years 2012-2017; that were dedicated to 8 sectors including the health sector (automotive, machine manufacturing, ICT, energy, health, food & agriculture) and covering more than 100 critical technologies.

The Surveys have been conducted online subjected to all project coordinators; namely 13.000 thousand experts for the 2012-2017 period and the participation of more than 4.0000 thousand project coordinators has been provided, 900 of which were in the health sector.

The funded RDI projects have been evaluated through these surveys comprehensively; by means of their technological readiness levels, development of critical products/technologies and fulfilment of the

targets set within the former period, intellectual property rights, the level of productisation and commercialization of projects' outputs.

According to the results of this extensive surveys on the basis of sectors, it has been acknowledged that the highest rates of commercialization has been realized in the information and communication technologies, machinery manufacturing and automotive sectors, respectively. The outputs of 1 out of every 2 projects received R&D and innovation support in the ICT sector have ended up with productisation and commercialization. The sector with the lowest likelihood of commercialization was to be the health sector with a ratio of 3%. This was, however, an expected finding, since the R&D and innovation in the health sector comprises rather longer terms and periods, such as clinical stages in comparison with any other RDI intensive sector. R&D and innovation processes, especially in the sub-fields of pharmaceuticals, vaccines, biomaterials and treatment development, take at least a time duration of 10-15 years, besides the higher costs.

Among the sub-technology areas of the health sector, the highest rate of commercialisation R&D and innovation activities were observed in biomedical devices technologies and biomedical diagnostic kits accordingly. Due to varied investment initiatives, dedicated RDI support mechanisms and business models, and of course their nature depending mostly on engineering technology and ICT, productisation has been achieved in these sub-areas rather quickly with an approximate ratio of 17% in biomedical devices technologies and 24% in biomedical diagnostic kits.

**2. Can you provide examples of policies/projects/initiatives aimed at strengthening national health innovation systems? For example, how does your country build innovative capabilities through investments in R&D and human capital? What institutional and regulatory arrangements are in place to stimulate healthcare innovation and effectively address safety, ethical and other concerns?**

Within the recent years, Turkey has launched two main significant RDI support mechanisms in order to strengthen the smart specialization and stimulate co-creation between academic and industrial innovation hubs and systems in high-technology areas including the health sector.

Through the newly established programme launched by TUBITAK for strengthening collaborative R&D linkages within the local ecosystem named "**the Industrial Innovation Networks Mechanism (SAYEM)**" private sector firms, especially those that possess of an R&D and product design centre, form a network with other firms of the value chain of the targeted technology-based product; together with end-users, technology development zones and universities. As a whole, the network are to be provided the opportunity to take center stage in the innovation system for co-creating high value-added products and technologies for the market.

The Industrial Innovation Networks Mechanism is characterised by several features:

- The networks target the convergence of actors on both ends of the technology development and commercialization spectrum. Researchers of high value-added technologies and products will interact with end-users in a way as to accelerate the commercialization process across the supply and demand sides.

- The targeted Technology Readiness Level is expected to be between TRL 5 or 6 and 9, thereby targeting technological innovation that is closer to the market. 28 consortia supported under the programme's first phase opened in 2018 are being expected to deliver their road maps to TÜBİTAK in 2020.

- The networks will be established in two phases. In the first phase, the support grant will be directed to establishing models of cooperation and networks based on a "product/commercialisation roadmap" that includes a business model. In the second phase, the support grant will be provided to implementing the R&D and innovation activities that take place in the product/commercialisation roadmap based on the strategic milestones that have been put forth by the actors who are involved in the network for co-creating high value-added products.

- In the progression between the first and second phases of SAYEM, it is necessary that the product/commercialisation roadmap provides a satisfactory coverage based on the strategic milestones that have been identified. The effectiveness of the product/commercialisation roadmap is one of the evaluation criteria in determining whether a project progresses from the first to the second phase.

**Support Program for Centers of Excellence (TÜBİTAK 1004)**, is another recently designed and launched R&D support programme by TÜBİTAK, which provides a new insight into specialization of Research Infrastructures in Turkey towards becoming R&D Hubs in critical and high technology areas including the health sector as a high-technology area. Within the frame of the program "High Technology Platforms", the centers are obliged to engage in collaborations with industry. The program is expected to pave the way to specialization of Research Infrastructures via Big Scale R&D Projects. The research centres which have been established through public funds and accredited within scope of the Law No: 6550, as well as the research centres of "Research Universities" which are announced by Higher Education Council will be provided with the chance to acquire large-scaled R&D project support from TUBITAK, in order to specialize in a thematic field and to become a sustainable high technology hubs in Turkey.

The program is expected to highly contribute the efficient use of research infrastructures and encourage their sustainability based on their specialization in a scientific and technological field and increase their collaborations with industry.

The High Technology Platforms are to be characterised by several features:

- In the first phase, the actors of the High Technology Platforms prepare “technology acquisition roadmaps.” These technology acquisition roadmaps will address the gap between technology-based ideas and technology-based products, commonly identified between TRL 3-6 as the “Valley of Death.”

- For progression to the second phase, the effectiveness of the technology acquisition roadmaps will be one of the evaluation criteria.

- In the second phase, the platforms will be supported to realize the strategic milestones that are claimed for the development of high technology products.

- The performance of the High Technology Platforms will be monitored according to milestones in the technology acquisition roadmaps.

This program provides a new insight into specialization of Research Infrastructures in Turkey towards becoming RDI Hubs in critical technology areas including the health sector as a high-technology area. Within the frame of the program “Call for High Technology Platforms” is launched and for the project proposals, the centers are obliged to engage in collaborations with industry.

The support and the establishment of the platforms realize in two phases. In the first phase, the members of the platform set up the consortium, prepare “technology acquisition roadmaps”, which address the gap between technology-based ideas and technology-based products, commonly identified between TRL 3-6 as the “Valley of Death”. The second phase is dedicated for conducting RDI activities aligned with the roadmap. Considering the 2018 call, 18 platforms were funded for Phase 1; evaluations for Phase 2 funding are still ongoing.

The program is expected to pave the way to specialization of Research Infrastructures via big scale RDI projects. The research centres which have been established through public funds and accredited within scope of the Law No: 6550, as well as the research centres of “Research Universities” which are announced by Higher Education Council are to be provided with the chance to acquire large-scaled RDI project support by TUBITAK, in order to specialize in a thematic field and to become a sustainable high technology hubs in Turkey. The program is expected to highly contribute the efficient use of research infrastructures and encourage their sustainability based on their specialization in a scientific and technological field and increase their collaborations with industry. Moreover, the call and the program targets TRLs 3-6 and aims formation of technology platforms in which the research infrastructures of HEIs, private sector RDI / design centers, and public RDI units take place and co-create.

Both support programs target productive and collaborative interactions between R&D and innovation actors in the local ecosystem. In this respect, rather than passively observing a widening of the innovation gap, the focus of our policy efforts is to proactively enable a “closing of the innovation gap” between R&D and innovation actors as areas of important opportunities.

Within the frame of both TUBITAK 1004 High Technology Platforms Call and the “Industrial Innovation Networks Mechanism” (SAYEM), the networks are to be established in two phases. In the first phase, the support grant will be directed to establishing models of cooperation and networks based on a roadmap and a business model. In the second phase, the support grant will be provided to implementing the R&D and innovation activities that take place in the roadmap and strategic milestones that have been put forth by the actors who are involved in the network for co-creating high value-added products.

**3. Could you share case studies of regional and international cooperation that have strengthened health capacities, particularly in developing countries? Can you provide success stories involving regional or global cooperation in academic research networks, STI diplomacy, or initiatives to make healthcare innovations accessible for all?**

International cooperation and having international joint research projects is very important to strengthen knowledge capacity in health. In this view universities of Turkey take part in European Union’s Horizon 2020 projects. The scope of the projects cover a wide range of topics in health; from diagnostic to vaccine, from cancer treatment to biomedical devices, etc. Between 2015 and 2020, Turkish Universities have participated in 27 Horizon 2020 health projects with a total project budget of 461 Million Euros.

**4. Could you suggest some contact persons of the nodal agency responsible for projects/policies, related technologies and international collaboration in this context as well as any experts (from academia, private sector, civil society or government) dealing with projects in this area? We might contact them directly for further inputs or invite some of them as speakers for the CSTD inter-sessional panel and annual session.**

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**5. Do you have any documentation, references, or reports on the specific examples on the priority theme in your country or region?**

The Scientific and Technological Research Council of Turkey (TÜBİTAK) has been preparing biennial thematic priority-setting studies for RDI, since 2012 on a regular basis; which includes priority technologies/areas, RDI priority-topics and dedicated tech-intensive products to be developed in order to achieve determined RDI targets. In order to ensure a more target based and comprehensive call systematic, prioritization efforts within the scope of the current national strategies at all levels and by all means including technology roadmaps, the Input Supply Strategy (GITES), the questionnaires for the

determination of the private sector's RDI Problems and global trends particularly OECD projections and EU Commission's monitoring studies have been utilized as inputs for the thematic priority-setting studies. *The Current Thematic Priority-Setting Study* which comprises the recent target based RDI priorities in detail, has been prepared for a two year period (2019-2020), has been announced publicly online by TUBITAK. This planning of TUBITAK provides an insight on the technological focus areas until the forthcoming STI Strategy period.

Three main studies has been completed to put forth the priority themes: Mapping of national needs, mapping of global trends and determination of current technological competency. Mapping of national needs has been realized by extraction of technological needs from national strategies, policies and sectoral studies of public bodies. Mapping of global trends have been extracted by examination of international reports and studies. The technological competency in each area has been determined via the analysis of results from "Output Survey of Funded RDI Projects". A total of 154 priority themes for RDI were identified, each with the indication of relevant technology readiness levels, technical content and expected results from RDI projects.

Within this scope, 24 RDI themes have been determined in total for the health sector; which includes various hot RDI topics in the sub-priority tech areas of "digital technologies in health and healthcare", "bionanotechnologies and biomaterials", "pharmaceuticals", "biomedical equipments& devices", "electronic healthcare systems and services", "medical diagnostic kits & devices", "vaccine technologies". AI related healthcare technologies such as "digitalization in health and healthcare systems", "neurosciences-brain studies" and "robotic surgery technologies" remain as the hottest topics to be mentioned for the upcoming years, as well as vaccine and pharmacological technologies in accordance with the COVID-19 pandemic.

## Inputs from the Ministry of Health

**PRIORITY THEME 2:** Using science, technology and innovation to close the gap on SDG 3, good health and well-being

## United Nations Commission on Science and Technology for Development (CSTD)

Dear CSTD member,

As you are aware, the CSTD 23rd annual session selected "Using science, technology and innovation to close the gap on SDG 3, good health and well-being" as one of the priority themes for its 23rd session (2020-21 period).

Science, technology, and innovation (STI) can play an important role in strengthening the capacity of all countries, in particular developing countries for early warning, risk reduction and management of national and global health risks as described in SDG 3D. Data science, biomedical science and engineering and other technologies can broadly transform health and medicine and specifically support countries and regions in their responses to emerging health crises as well as in their preparedness for future threats. Beyond specific technological innovations, STI policy advice, diplomacy, and international cooperation also play a prominent role in current and future infectious disease preparedness and response. The theme will explore experiences about using STI to strengthen health outcomes as well as approaches to regional and global STI cooperation in this field.

The CSTD secretariat is in the process of drafting an issues paper on the theme to be presented at the CSTD inter-sessional panel meeting. In this context, we would like to solicit inputs from the CSTD members on this theme. We would be grateful if you could kindly answer the following questions based on your experience from your country or region.

1. Can you give examples of projects/policies in your country aimed at using science, technology, and innovation for early warning, risk reduction and management of national risks? What are the main outcomes? And What are the main challenges confronted while trying to implement these projects/policies in your country or region?

COVID-19 outbreak all around the world has showed us that rapid mitigation and management policies are only possible through technological and innovative approaches. For this reason, Ministry of Health of Turkey rapidly developed significant solutions in the earlier stages of COVID-19 outbreak, which are Korona Onlem (meaning: Corona Measure), Hayat Eve Sığar (meaning: Life Fits Into Home//HES), FITAS (Filiation and Isolation Tracking System) and RUHSAD applications. All these systems/projects/applications provide extensive contribution to Ministerial efforts in terms of early warning, risk reduction and risk management.

Korona Onlem, as a machine learning-based COVID-19 pre-evaulation application, enables individuals to evaluate themselves for potential COVID-19 infection ratio through a couple of detailed questions. Following the completion of questions, application displays the possible Covid-19 infection status and advises the user to visit a healthcare institution, if the risk is high.

Also, thanks to Hayat Eve Sığar (Life Fits Into the House) application, individuals are informed with periodical messages on Covid-19 and motivated through displaying the exact status of the infection all around the country. As a part of that operation, people are able to track their family etc. upon the open consent of the tracked and psychologically and socially supportive contents are shared with individuals. As part of the system, users can generate HES codes for sharing Covid-19 risk status with institutions and individuals for activities like transportation or visit. Shared HES codes can be checked through the app or services provided to institutions. This code solely serves as a risk mitigator for infection in long distance transportation vehicles during travel. Covid-19 patients or contacted people will not be able to use public transportation. This code is utilized by the Ministry to inform people if anyone in the same vehicle is disgnosed as positive.

FITAS is the first digital solution developed against Covid-19. Thanks to this project, exact location of sensitive population (Covid-19 diagnosed people, people contacting with Covid-19 patients, people over 65 years old, people aged between 18-65 with chronic conditions and people below 20 years old etc.) have been detected and watched if they are properly isolated. If an individual from the sensitive population leaves its location, they are communicated through IVR technology and asked them to return their isolation location and administrative authorities are informed accordingly.

Healthcare workforce must also be supported in this process. So, in order to support them and their family, RUHSAD project is developed currently. Thanks to RUHSAD system, healthcare staff and their children can use the application for getting psychological support from professionals. The app is open to public and private healthcare staff and their children.

Turkey Health Security Project has also been in implementation in Turkey since September 2018 but the activities of the project are not directly related to science, technology and innovation. The activities mostly are related to acute public health threats, response and training.

2. Can you provide examples of policies/projects/initiatives aimed at strengthening national health innovation systems? For example, how does your country build innovative capabilities through investments in R&D and human capital? What institutional and regulatory arrangements are in place to stimulate healthcare innovation and effectively address safety, ethical and other concerns?

Strengthening national health systems through innovation and setting the concept of innovation as a strategic priority is a widely shared vision within the service levels of the Ministry. For this reason, TUSEB (Presidency of Turkish Healthcare Institutes) was founded in 2015 including R&D institutes such as Turkish Cancer Institute, Turkish Institute of Biotechnology, Turkish Institute of Maternal, Infant and Adolescent Health, Turkish Institute of Public Health and Chronic Diseases, Turkish Institute of Traditional and Complementary Medicine, Turkish Institute of Healthcare, Quality and Accreditation, Turkish Institute of Healthcare Policies, Turkish Vaccine Institute, Turkish Institute of Healthcare Data Research and Institute of Artificial Intelligence Applications. All of the research capacities and infrastructures have been merged under the umbrella of TUSEB. Furthermore, all types of R&D activities including technology transfer are conducted under TUSEB.

The Health Industries Steering Committee (SEYK) has been established with the Presidential Circular No. 2018/15 dated 13/12/2018 within the scope of the action of creating the "Health Industries Steering Committee" included in the “Tenth Development Plan (2014-2018) Action Plan of Structural Transformation Program in Health Industries.

Committee consists of the Deputy Minister of Treasury and Finance, Deputy Minister of Industry and Technology, Deputy Minister of Commerce, Social Security Institution President, Vice President of Strategy and Budget, President of the Turkish Medicines and Medical Devices Agency, President of Health Institutes of Turkey (TÜSEB) and President of the Scientific and Technological Research Council of Turkey (TUBITAK) under the chairmanship of the Minister or Deputy Minister to be appointed of Health.

Officials from TUBITAK and TUSEB, two of the important research institutions of Turkey, also take part in the Sub-Committee established within the scope of SEYK, and including innovation-oriented projects that Turkey needs and increasing the technological competence of Turkey in the field of health by moving it to different fields have been determined as one of the goals.

In this context, the development of SMA diagnostic kit and the production of plasma products from domestic plasma and the Production Projects of Coagulation Factors with Recombinant DNA Technology, which have been decided to be carried out under the responsibility of the General Directorate of Public Health, are also on the agenda.

In addition, potential research and project development activities are supported within specific project calls and prominent research studies are awarded under different categories. Researchers can get recent news about the upcoming project calls, awards and all types of notifications through the official website (https://www.tuseb.gov.tr/) and be updated.

3. Could you share case studies of regional and international cooperation that have strengthened health capacities, particularly in developing countries? Can you provide success stories involving regional or global cooperation in academic research networks, STI diplomacy, or initiatives to make healthcare innovations accessible for all?

HIMSS success of Turkish Ministry of Health can be reviewed as a shared success on international level to display the power of digitization in Turkish healthcare system.

HIMSS (Healthcare Information Management Systems Society) Healthcare Information and Management Systems Society, Inc. (HIMSS) is a global advisor and thought leader supporting the transformation of the health ecosystem through information and technology. As a mission-driven non-profit, HIMSS offers a unique depth and breadth of expertise in health innovation, public policy, workforce development, research and analytics to advise global leaders, stakeholders and influencers on best practices in health information and technology. Through its innovation engine, HIMSS delivers key insights, education and engaging events to healthcare providers, governments and market suppliers, ensuring they have the right information at the point of decision.

Headquartered in Chicago, Illinois, HIMSS serves the global health information and technology communities with focused operations across North America, Europe, the United Kingdom, the Middle East and Asia Pacific. Members include more than 80,000 individuals, 480 provider organizations, 470 non-profit partners and 650 health services organizations.

HIMSS classifies and evaluates healthcare facilities in terms of digitalization (lowest level is Stage 1 and highest level is Stage 7) and uses a set of criteria to realize this evaluation.

The collaboration of Turkish Ministry of Health and HIMSS began in 2012 and thanks to the shared vision of innovation and digitization, Turkey has become the most digitalized country in Europe in terms of healthcare services just within eight years with 176 Stage 6 hospitals and 3 Stage 7 (totally paperless) hospitals all around the country. For comparison, the total number of Stage 6 hospitals in accredited all EU countries is 30 and the total number of Stage 7 hospitals is 3.

This hospital digitalization success is the product of strong collaboration and shared vision of public and private sectors, universities and affiliated professional organizations together.

Furthermore, given the importance of experience and knowledge sharing among all countries in their fight against COVID-19, Turkey launched an e-learning project with World Health Organization to share Turkey's experience with COVID-19. The e-learning project will focus on Turkey's experience on epidemiology, diagnosis, case management, ICU management, microbiology, radiology, infection control and vaccine studies. The first round of trainings are planned to aim Turkic Council Member Countries, the second round will Eastern European Countries and the third round of the training will aim African Countries. The project will offer training videos through a web-based portal of the Ministry, which is known as USES (Distance Health Learning System) to health workforce of targeted countries. Additional modules and applications will be developed to offer training courses on USES. Videos include recording of courses provided by members of Turkey's Coronavirus Scientific Advisory Board who are well-known and high-profile professors in their respective areas. The courses will be recorded in English, and will be translated into four other United Nations (UN) languages (Arabic, French, Russian and Spanish).

4. Could you suggest some contact persons of the nodal agency responsible for projects/policies, related technologies and international collaboration in this context as well as any experts (from academia, private sector, civil society or government) dealing with projects in this area? We might contact them directly for further inputs or invite some of them as speakers for the CSTD inter-sessional panel and annual session.

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5. Do you have any documentation, references, or reports on the specific examples on the priority theme in your country or region?

- 11th Development Plan of Republic of Turkey (https://www.sbb.gov.tr/wp-content/uploads/2019/07/OnbirinciKalkinmaPlani.pdf)
- Strategic Plan of Turkish Ministry of Health (2019-2023) (https://stratejikplan.saglik.gov.tr/files/TC-Saglik-Bakanligi-2019-2023-Stratejik-Plan.pdf#zoom=55)

Please send your responses and any further inputs on the theme to the CSTD secretariat (stdev@unctad.org) by 7 October 2020. We look forward to receiving your valuable inputs.

Sincere Regards,

CSTD secretariat

**Answers provided by the Ministry of Industry and Technology of Turkey to the questions 2 and 3 under Priority Theme 2**

Regulation on Clustering Support Programme was issued on 15 September 2020 by the Ministry of Industry and Technology of the Republic of Turkey. In the framework of the said regulation, many projects run by cluster enterprises within the context of 5 year work plans aiming to improve value chains with a specific vision are supported with 50 % grants.

This Programme aims to increase competitiveness, innovative and productivity capacities of the Turkish industry, to produce mainly high tech goods, also to transform it as responsive to society and environment with a qualified work force. Istanbul Health Industry Clustering Enterprise (ISEK) is one of the associates that is supported in line with this Programme in order to strenghten the national health innovation system.

Istanbul Health Industry Clustering Enterprise (ISEK) having its own medical device production facility, accdited laboratory, bio-entreprenourship and innovation programmes is considered to have an important trigger role in commercialization of the Turkish Medical Device Sector together with its stakeholder universities, sivil society organisations and industrial enterprises.